

Biochars impact on water infiltration and water quality through a compacted subsoil layer

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ABSTRACT

Soils in the SE USA Coastal Plain region frequently have a compacted subsoil layer (E horizon), which is a barrier for water infiltration. Four different biochars were evaluated to increase water infiltration through a compacted horizon from a Norfolk soil (fine-loamy, kaolinitic, thermic, Typic Kandiudult). In addition, we also evaluated biochars effect on water quality. Biochars were produced by pyrolysis at 500°C from pine chips (*Pinus taeda*), poultry litter (*Gallus domesticus*) feedstocks, and as blends (50:50 and 80:20) of pine chip:poultry litter. Prior to pyrolysis, the feedstocks were pelletized and sieved to > 2-mm pellets. Each biochar was mixed with the subsoil at 20 g/kg (w/w) and the mixture was placed in columns. The columns were leached four times with Milli-Q water over 128 d of incubation. Except for the biochar produced from poultry litter, all other applied biochars resulted in significant water infiltration increases (0.157 to 0.219 mL min⁻¹; $P < 0.05$) compared to the control (0.095 mL min⁻¹). However, water infiltration in each treatment were influenced by additional water leaching. Leachates were enriched in PO₄, SO₄, Cl, Na, and K after addition of poultry litter biochar, however, their concentrations declined in pine chip blended biochar treatments and after multiple leaching. Adding biochars (except 100% poultry litter biochar) to a compacted subsoil layer can initially improve water infiltration, but, additional leaching revealed that the effect remained only for the 50:50 pine chip:poultry litter blended biochar while it declined in other biochar treatments.